

4.3 The Sine Law in Acute TrianglesThe Sine Law is True in any acute triangle:

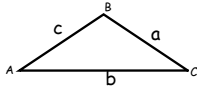
for finding sides:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

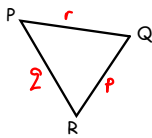
for finding angles:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Pay attention at the labeling of a triangle:



The vertices are labeled in capitals, and each side corresponds to the opposite vertex, labeled in lower case letter.

Ex 1:

Given $\triangle ABC$ where: $c=4.7$
 $a=5.2$
 $\angle A=32^\circ$

Find: $\angle C$

Solution:

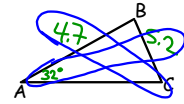
$$\frac{\sin A}{a} = \frac{\sin C}{c}$$

$$4.7 \cdot \frac{\sin 32^\circ}{5.2} = \frac{\sin C}{4.7}$$

$$\frac{4.7 \sin 32^\circ}{5.2} = \sin C$$

$$\sin^{-1}\left[\frac{4.7 \sin 32^\circ}{5.2}\right] = C$$

$$C \doteq 29^\circ$$

 \therefore angle C is 29° Ex 2:

In a triangle XYZ the following is given:

 $z=6.8$ cm, $\angle Z=42^\circ$, $\angle Y=77^\circ$

Solve triangle XYZ.

(To solve a triangle means to find ALL unknown sides and angles)

$$\angle X = 180^\circ - 42^\circ - 77^\circ$$

$$\angle X = 61^\circ$$

$\therefore \angle X$ is 61° , side y is
 9.9 cm and side
 x is 8.9 cm

$$\frac{y}{\sin 77^\circ} = \frac{6.8}{\sin 42^\circ}$$

$$y = \frac{6.8 \sin 77^\circ}{\sin 42^\circ}$$

$$y \doteq 9.9$$

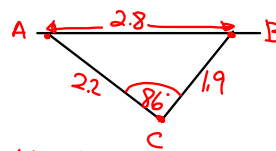
$$\frac{x}{\sin 61^\circ} = \frac{6.8}{\sin 42^\circ}$$

$$x = \frac{6.8 \sin 61^\circ}{\sin 42^\circ}$$

$$x \doteq 8.9$$

Ex 3:

Toby uses chains and a winch to lift engines at his garage. Two hooks in the ceiling are 2.8 m apart. Each hook has a chain hanging from it. The chains are of 1.9 m and 2.2 m. When the ends of the chains are attached, they form an angle of 86° . In this configuration, what acute angle to the nearest degree does each chain make with the ceiling?



$$\angle A \doteq 43^\circ$$

$$\angle B \doteq 52^\circ$$



Ex 4:

Two angles in a triangle measure 54° and 38° . The longest side of the triangle is 24 cm longer than the shortest side. Calculate the shortest and longest sides.



$$180^\circ - 54^\circ - 38^\circ = 88^\circ$$

88° is the longest side

54° is the shortest side

38° is the middle side

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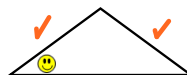
54° is the shortest side

38° is the middle side

88° is the longest side

54° is the shortest side

Use the Sine Law when you have an oblique (non right) triangle that has:



- two sides and the angle across from one known side



- two angles and any side

Use the Sine Law when you have an oblique (non right) triangle that has:

